

Govt. Polytechnic Hamirpur (H.P.)
Lecture Planning (Theory)

Branch : Electrical Engg. Semester: 5TH
Subject : Switch Gear And Protection Session: Aug - Dec 2026
Teacher: Vivek Kishore Class Room : _____

Sr. No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Referenc e Resource s	Remarks
1.	10	Unit - I Basics of Protection	Necessity, functions of protective system, Normal and abnormal conditions. Types of faults and their causes. Protection zones and backup protection	R1,R4,R5	
2.	18	Unit - II Circuit Interruption Devices	Isolators - Vertical break, Horizontal break and Pantograph type. HRC fuses - Construction, working, characteristics and applications. Arc formation process, methods of arc extinction (High resistance and Low resistance), Arc voltage, Recovery voltage, Re-striking voltage, RRRV, HT circuit breakers: Sulphur-hexa Fluoride (SF ₆), Vacuum circuit breaker - (Working, construction, specifications and applications). L.T. circuit breaker: Air circuit breakers (ACB), Miniature circuit breakers (MCB), Moulded case circuit breakers (MCCB) and Earth leakage circuit breaker (ELCB)) - Working and applications. Brief introduction to gas insulated switchgear.	R5	
3.	18	Unit- III Protective Relays	Fundamental quality requirements: Selectivity, Speed, Sensitivity, Reliability, Simplicity, Economy. Basic relay terminology - Protective relay, Relay time, Pick up, Reset current, current setting, Plug setting multiplier, Time setting multiplier. Protective relays: Classification, principle of working, construction and operation of - Electromagnetic attraction (Attracted armature type, Solenoid type and Watt-hour meter type only) relays. Electromagnetic Induction relays: Over current relays: Block diagram, working. Distance relaying- Principle, operation of Definite distance relays. Directional relay: Need and operation. Operation of current and voltage differential relay. Brief introduction to Thermal Relay. Brief introduction to Static and Microprocessor based relays and their applications.	R6	
4.	14	Unit- IV Protection of Alternator and Transformer	Faults, Differential protection over current, earth fault, overheating and field failure protection. Reverse power protection. Transformer Protection Different Faults (brief introduction), Differential, over current, earth	R1,R2,R3	

		Alternator Protection	fault, over heating protection, Limitations of differential protection. Buchholz relay: Construction, operation, merits and demerits		
5.	10	Unit- V Protection of Motors, Bus-bar and Transmission Line Motor	Faults, Short circuit protection, Overload protection, Single phase preventer, 8 Bus bar and Transmission line Faults on Bus bar and Transmission Lines. Bus bar protection: Differential and Fault bus protection. Transmission line: Over current, Distance and Pilot wire protection.	R1,R2,R3	

References

- R1. Mehta V. K ;Rohit Mehta, Principles of Power System, S .Chand and Co., New Delhi
R2 Rao.Sunil S., Switchgear and Protection, Khanna Publishers, New Delhi,
R3. Singh, R. P., Switchgear and Power System Protection, PHI Learning, New Delhi
R4. Gupta. J. B., Switchgear and Protection, S. K. Kataria and Sons, New Delhi.
R5. Vrerapan, N.,Krishnamurty, S. R., Switchgear and Protection, S .Chand and Co., New Delhi.

Signature of Teacher with Date

01/02/2026

Signature of H.O.D.

Govt. Polytechnic Hamirpur (H.P.)

Lesson Planning (Theory)

Branch : ELECTRICAL ENGG.

Semester : 5th

Subject : Energy Conservation and Audit

Course Code : EEPC305

Teacher : Devender Kumar, Sr. Lect. EE

Class Room :

S.No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Reference Resources	Remarks
1	4	Energy Conservation Basics	Energy Scenario: Primary and Secondary Energy, Energy demand and supply, National scenario. Energy conservation and Energy audit; concepts and difference, Star Labelling: Need and its benefits.	R1 R2 R3	
2	12	Energy Conservation in Electrical Machines	Need for energy conservation in induction motor. Energy conservation techniques in induction motor by: Motor survey Matching motor to load. Operating in star mode. Rewinding of motor. Replacement by energy efficient motor, Periodic maintenance Energy efficient motor; significant features, advantages, applications and limitations. Need for energy conservation in transformer; Energy efficient transformers, amorphous transformers; epoxy Resin cast transformer / Dry type of transformer.	R1 R2 R3	
3	13	Energy conservation in Electrical Installation systems	Aggregated Technical and commercial losses (ATC); Power system at state, regional, national and global level. Technical losses; causes and measures to reduce these (no expression only theory part) a) Controlling I ² R losses. b) Optimizing distribution voltage c) Balancing phase currents Energy conservation in lighting sources: a) Replacing Lamp sources. b) Using energy efficient luminaries.	R1 R2 R3	

Govt. Polytechnic Hamirpur (H.P.)

Practical Planning & Coverage

Branch : ELECTRICAL ENGG.

Semester : 5th

Subject: Energy Conservation and Audit

Course Code: EEPC305

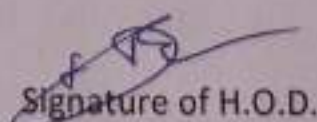
Teacher: Ms. Parveen Dogra, Lect. EE

Laboratory:

Pract. No.	Description of Practical	Reference for Procedure/ Write up	Likely Dates	Actual Dates	Signature
1	Identify star labelled electrical apparatus and compare the data for various star ratings.	Lab Manual	3.8.26 6.8.26		
2	Determine the reduction in power consumption by replacement of lamps in a class room /laboratory.	Lab Manual	10.8.26 13.8.2026		
3	Determine the reduction in power consumption by replacement of Fans and regulators in a class room / laboratory.	Lab Manual	17.8.26 20.8.26		
4	Collect electricity bill of a residential consumer and suggest suitable means for conservation and reduction of the energy bill.	Lab Manual	24.8.26 27.8.26		
5	Prepare an energy audit report (Phase-I)	Lab Manual	31.8.26 3.9.26		
6	Prepare an energy audit report (Phase-II)	Lab Manual	7.9.26 10.9.26		
7	Prepare an energy audit report (Phase-III)	Lab Manual	14.9.26 17.9.26		

Parveen
01/8/2026

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Govt. Polytechnic Hamirpur (H.P.)
Lecture Planning (Theory)

Branch : Electrical Engg. Semester: 5th
Subject : SOLAR POWER TECHNOLOGIES Session: Aug-Dec-2026
Teacher: Archit Bharti Lab : EBLI

Sr. No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Reference Resources	Remarks
1.	12	Solar Energy	Solar Map of India: Global solar power radiation Different types of Solar water heaters: Construction, working. Different types of solar cookers, Solar Drying process, solar lighting, and Preventive maintenance of all of the above	R1,R4,R5	
2.	16	Concentrated Solar Power (CSP)	Concentrated Solar Power (CSP) plants or solar thermal electric systems, Parabolic Trough: Construction, working and specifications Parabolic Dish: Construction, working and specifications Fresnel Reflectors: Construction, working and specifications Preventive maintenance of all of the above	R2	
3.	16	Solar PV Systems	Solar PV cell: Types, construction, working of solar cells. Solar PV working principle: Series and parallel connections of solar modules. Solar Photovoltaic (PV) system: components, layout and working. Solar modules and solar arrays. Solar PV systems and typical specifications. Maintenance of all of the above.	R1	
4.	20	Solar PV Electronics	Solar Charge controllers: working and specifications, switchgear and cables Batteries: Different types for solar PV systems, Solar Inverters: working and specifications Solar Power tracking: construction, working, tilt angle, maximum power point tracking (MPPT) Maintenance of these systems.	R1,R2,R3	
5.	16	Solar PV Off-grid and Grid Tied Systems	Solar off grid systems: layout and specifications Solar Grid tied (on grid) systems: Working principle of grid-tied dc-ac inverter, grid synchronization and active power export. Brief introduction to Solar-Wind Hybrid systems.	R1,R2,R4	

Teaching Resources:

- R1: Solanki, Chetan Singh. - Solar Photovoltaics: Fundamentals, Technologies and Applications, PHI Learning, New Delhi, ISBN: 9788120351110
R2: Kothari, D.P. et al: Renewable Energy Sources and Emerging Technologies, PHI.
R3: David M. Buchla, Thomas E. Kissell, Thomas L. Floyd, - Renewable Energy Systems, Pearson Education, 14 New Delhi, ISBN: 9789332586826
R4: Rachel, Sthuthi, Earnest, Joshua: - Wind Power Technologies, PHI Learning
R5: O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173-683.

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Govt. Polytechnic Hamirpur (H.P.)
Practical Planning & Coverage

Branch : Electrical Engg. _____ Semester: 5th _____
Subject : SOLAR POWER TECHNOLOGIES LAB Session: Aug-Dec-2026 _____
Teacher: Archit Bharti _____ Lab : EMMI LAB _____

Pract. No.	Description of Practical	Reference for Procedure/ Writeup	Likely Dates	Actual Dates	Signature
1.	Assemble the parabolic dish CSP plant.	R1 R2 R3	20/8/2026 & 19/8/2026		
2.	Dismantle the parabolic dish CSP plant.	R1 R2 R3	03/9/2026 & 02/9/2026		
3.	Troubleshoot a CSP plant.	R1 R2 R3	17/9/2026 & 16/9/2026		
4.	Assemble the solar PV system.	R1 R2 R3	24/9/2026 & 23/9/2026		
5.	Dismantle the solar PV system.	R1 R2 R3	8/10/2026 & 7/10/2026		
6.	Troubleshoot a solar PV system.	R1 R2 R3	15/10/2026 & 14/10/2026		
7.	Troubleshoot a solar PV panels and arrays.	R4	5/11/2026 & 04/12/2026		

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Government Polytechnic Hamirpur
Lecture Planning (Theory)

Branch : Electrical Engg.
Subject : ELECTRICAL TESTING AND COMMISSIONING
Teacher : Ms. Parveen Dogra

Semester: 5th
Session: Aug 26 - Dec 26
Class Room : L2

Sr. No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Reference Resources	Rem
1.	1-12	Electrical Safety and Insulation	Do's and don'ts regarding safety in domestic electrical appliances as well for substation/power station operators, Electrical safety in industry/power stations/ substations at the time of operation/ control/maintenance. Fire detection alarm, fire-fighting equipments Factors affecting life of insulating materials. Measuring insulation resistance by different methods such as i) Polarization, ii) Dielectric, absorption, iii) Megger and to predict the condition of insulation.	R1,R2,R3,	
2.	13-25	Installation and Erection	Concept of foundation for installation of machinery. Requirements of foundation for static and rotating electrical machinery. Concept of leveling and aligning Procedure, for leveling and aligning alignment of direct coupled drive, effects of mis-alignment Installation of transformer and procedure of installation of transformer. Requirements of installation of pole mounted transformer	-do-	
3.	26-38	Testing and Commissioning	Concept of testing. Objectives of testing. Roles of I.S.S. in testing of electrical equipment. Types of tests and concepts. Routine tests, type tests, supplementary test, special tests. Methods of testing - Direct/Indirect/Regenerative testing. Tolerances for the various items for equipment -transformer, induction motor, dc motor, synchronous machines Commissioning. Tests before Commissioning for transformer, induction motor, alternator	-do-	
4.	39-51	Trouble-shooting Plans	Internal and external causes for failure / abnormal operation of equipment. List of mechanical faults, electrical faults and magnetic faults in the electrical equipment, remedies, applications Use of tools like megger, earth tester and growler	-do-	
5.	52-64	Maintenance	Concept of maintenance, types of maintenance, routine, preventive and breakdown maintenance. Causes of failure of electrical machines. Preventive maintenance-procedure or developing maintenance schedules for electrical machines. Factors affecting preventive maintenance schedules. Concept of TPM, Pillars of TPM Identification of different types of faults developed such as mechanical/ electrical/ magnetic faults.	-do-	

Parveen
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Signature of HOD (EE)

Reference Resource:

R1: Deshpande.M. V. PHI Learning Pvt. Ltd., 2010, Design and Testing of Electrical Machines
R2: Rao, B V S Asia Club House, First Reprint, 2011, Operation and Maintenance of Electrical Equipment
R3: Rosenberg. Mc GRAW-HILL, 1st Edition, May 2003, Maintenance and Repairs, ISBN No

Government Polytechnic Hamirpur
Lecture Planning (Theory)

Branch : Electrical Engg.
Subject : RET
Teacher : Ms. Parveen Dogra

Semester: 5th
Session: Aug 26 - Dec 26
Cass Room : L2

Sr. No.	No. of Lectures	Chapter/ Unit Description	Detail of Contents	Reference Resources	Rem
1.	1-12	Introduction	World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilization; Renewable Energy Scenario in India and around the World; Potentials; Achievements/Applications; Economics of renewable energy systems.	R1,R2,R3,	
2.	13-25	Solar Energy	Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation; Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications	-do-	
3.	26-38	Wind Energy	Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.	-do-	
4.	39-51	Biomass Energy	Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Biodiesel; Cogeneration; Biomass Applications	-do-	
5.	52-64	Other Renewable Energy Sources	Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.	-do-	

Parveen
Signature of Teacher with Date 01/8/2026

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Signature of HOD (EE)

Reference Resource:

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.